2019

Training Teachers in Inclusive Preschool Classrooms to Monitor Child Progress and Make Data-based Decisions through Direct Behavioral Observation

Collin Niles Shepley

University of Kentucky, collinshepley@uky.edu

Digital Object Identifier: https://doi.org/10.13023/etd.2019.068

STUDENT AGREEMENT:

I represent that my thesis or dissertation and abstract are my original work. Proper attribution has been given to all outside sources. I understand that I am solely responsible for obtaining any needed copyright permissions. I have obtained needed written permission statement(s) from the owner(s) of each third-party copyrighted matter to be included in my work, allowing electronic distribution (if such use is not permitted by the fair use doctrine) which will be submitted to UKnowledge as Additional File.

I hereby grant to The University of Kentucky and its agents the irrevocable, non-exclusive, and royalty-free license to archive and make accessible my work in whole or in part in all forms of media, now or hereafter known. I agree that the document mentioned above may be made available immediately for worldwide access unless an embargo applies.

I retain all other ownership rights to the copyright of my work. I also retain the right to use in future works (such as articles or books) all or part of my work. I understand that I am free to register the copyright to my work.

REVIEW, APPROVAL AND ACCEPTANCE

The document mentioned above has been reviewed and accepted by the student's advisor, on behalf of the advisory committee, and by the Director of Graduate Studies (DGS), on behalf of the program; we verify that this is the final, approved version of the student's thesis including all changes required by the advisory committee. The undersigned agree to abide by the statements above.

Collin Niles Shepley, Student

Dr. Jennifer Grisham-Brown, Major Professor

Dr. Ralph Crystal, Director of Graduate Studies

Training Teachers in Inclusive Preschool Classrooms to Monitor Child Progress and Make Data-based Decisions through Direct Behavioral Observation

---

DISSERTATION

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Education
at the University of Kentucky

By
Collin Niles Shepley
Lexington, Kentucky
Director: Dr. Jennifer Grisham-Brown, Professor of Interdisciplinary Early Childhood Education
Lexington, Kentucky
2019

ABSTRACT OF DISSERTATION

Training Teachers in Inclusive Preschool Classrooms to Monitor Child Progress and Make Data-based Decisions through Direct Behavioral Observation

Progress monitoring and data analysis are essential skills needed by classroom teachers within the implementation of multi-tiered systems of support for making data-based decisions about student progress and instruction. Within the early childhood MTSS research, consideration of teacher-collected progress monitoring data followed by data-based decision-making is rare. To provide teachers with a robust progress monitoring strategy, I trained preschool teachers of inclusive classrooms to use direct behavioral observations to collect data and inform their instruction.

The project experimentally evaluated teachers' generalization of acquired behaviors within the context of a single-case research design. The project's independent variable, teacher training, consisted of a video-based multimedia presentation and in-vivo feedback. The primary dependent variable was teachers' implementation of teacher-directed behavior observation procedures. Results indicate that teacher training was effective for three teachers, as evidenced by teachers reaching criterion levels of performance across consecutive days and sessions. Data on the durations of teacher training activities indicate that an average of 21 minutes of in-vivo feedback was provided to the teachers throughout training. Social and ecological validity data suggest that teachers perceived the training activities to be relatively non-intrusiveness and that the target progress monitoring strategies were of value to the teachers. A functional relation was established between training and teachers' implementation of direct behavioral observation procedures.

KEYWORDS: progress monitoring, preschool, MTSS, teacher training, measurement

Collin Niles Shepley

(Name of Student)

04/22/2019

Date

Training Teachers in Inclusive Preschool Classrooms to Monitor Child Progress and Make Data-based Decisions through Direct Behavioral Observation

By
Collin Niles Shepley

Dr. Jennifer Grisham-Brown
Director of Dissertation

Dr. Ralph Crystal
Director of Graduate Studies

04/22/2019
Date

DEDICATION

To my students and my teachers.

ACKNOWLEDGMENTS

This project was a logistical nightmare. I could not have pulled it off if it were not for the amazing teachers serving as my participants. Thank you for allowing me into your classrooms and being willing to learn a new skill. Y'all are my role models. In addition, my committee chair and members provided support and guidance throughout my doctoral program. Lastly, Sally, Clara, and Henry were always there when I needed them. I am forever grateful.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1. INTRODUCTION

1.1 MULTI-TIERED SYSTEMS OF SUPPORT

In recent years, multi-tiered systems of support (MTSS) have been a prominent area of research and practice within the fields of early childhood education and early childhood special education (Buysee & Peisner-Feinberg, 2013; Greenwood et al., 2011). Given the benefits of MTSS when implemented within early elementary grades (e.g., decreases in the number of students referred for special education services [VanDerHeyden, Witt, & Gilbertson, 2007], improvements in academic content areas [Burns, Appleton, & Stehouwer, 2005]), the focus in early childhood is warranted. Despite initial efforts to translate grade-school MTSS models into preschool settings, two initial meta-analyses found that studies adhering to contemporary design standards frequently failed to detect significant effects when targeting academic-related child outcomes (Shepley & Grisham-Brown, n.d.; Shepley, Grisham-Brown, & Lane, n.d.). A potential reason why these studies failed to detect effects pertains to the role of classroom personnel within the evaluated MTSS models. As highlighted in 2013 by the Division for Early Childhood of the Council for Exceptional Children (DEC), the National Association for the Education of Young Children (NAEYC), and the National Head Start Association (NHSA), a critical component of early childhood tiered support systems is that classroom personnel "track [children's] progress and determine when changes are needed" (p. 9). Within early childhood MTSS research, only five studies (17.24%) had classroom personnel collect progress monitoring data and even fewer (n=3, 10.34%) had personnel use the data to identify when changes to instruction may be needed (Shepley & Grisham-Brown; Shepley, Grisham-Brown, & Lane). If early childhood MTSS research is to inform practice, then

research should involve teachers and related classroom personnel in the roles they will be expected to serve within the implementation of MTSS. This has been evidenced in grade-school research, in which Stecker, Fuchs, and Fuchs (2005) found that teachers using progress monitoring data to inform their instruction were effective at improving student outcomes. In contrast, when teachers collected progress monitoring data but did not modify instruction based on their data, student outcomes did not improve.

1.1.1 Recommendations for Monitoring Progress in Early Childhood Settings

Within early care and educational settings, teachers are commonly required by funding and accreditation agencies to assess child learning on program or state learning standards. To accomplish this, validated curriculum-based assessments (CBAs) that are aligned with the standards are often used and recommended (Grisham-Brown & Pretti-Frontczak, 2011). These assessments cover many skills and areas of child development to provide a holistic understanding of a child's strengths, needs, and interrelated abilities. Given the breadth of skills CBAs cover, completion of the assessments for all children in a classroom can take weeks or months and may be conducted only two or three times throughout the school year. In contrast, recommendations for collecting progress monitoring data within a tiered support system suggest that data be collected monthly, weekly, or daily depending on the importance of the being taught (i.e., universal versus individualized outcomes; Grisham-Brown & Hemmeter, 2017). To accomplish routine progress monitoring, teachers need to conduct relatively brief assessments on specific individualized outcomes (Akers et al., 2016). An often-recommended series of measures for conducting such assessments are the Individual Growth and Development Indicators (IGDIs; Missall, Carta, McConnell, Walker, & Greenwood, 2008). Each measure is

designed to be administered in a one-to-one instructional arrangement with an assessor presenting a series of discrete trials to a child while collecting event recording data to determine if child responses are correct or incorrect. The assessments are intended to take only a couple minutes to complete. The outcomes targeted by the IGDIs were specifically selected given their associations with later success in school (e.g., Lonigan, Schatschneider, & Westburg, 2008). These outcomes include picture naming, rhyming, sound identification, selecting pictures that do not belong within a group, alliteration, oral counting, number naming, quantity comparison, and counting with one-to-one correspondence. Research indicates that the IGDIs are a promising progress monitoring measure for ensuring that valid data are collected on the previously mentioned outcomes (Walker, Carta, Greenwood, & Burzhardt, 2008).

Another recommended approach for monitoring child progress is the use of direct behavioral observation (McLean, Bailey, & Wolery, 2004). Direct behavioral observation has a long-standing history within the fields of special education and applied behavior analysis when progress monitoring data are needed on individualized child outcomes (Alberto & Troutman, 2006). The utility of direct behavioral observation is that it is robust to account for a wide variety of child behaviors, while still being feasible and reliable within classroom settings. For example, momentary time sampling is frequently used in early childhood special education research to estimate the occurrence or duration of free-operant child behaviors such as play, parent-child interactions, and stereotypy (Lane & Ledford, 2014). For measuring child behaviors that occur in response to a teacher-presented question or demand (e.g., “What shape is that?”), a teacher-directed behavioral observation (TDBO) system may be used. Ledford, Lane, Elam, and Wolery (2012)

reviewed a subset of the special education literature that commonly uses TDBOs (i.e., small group direct instruction) and found that TDBOs were consistently implemented with fidelity by classroom personnel and yielded reliable inter-observer agreement data on child outcomes. As it pertains to monitoring child progress on outcomes commonly assessed within the provision of MTSS in preschool classrooms, TDBOs may be a feasible and reliable method. Despite the prominence and utility of of direct behavior observation and TDBO in the field of special education, few studies have targeted training early childhood teachers to use these methods for monitoring child progress. Ledford, Zimmerman, Harbin, and Ward (2017) trained paraprofessionals to use TDBOs; however, the study occurred in a self-contained kindergarten classroom. Lane, Shepley, & Spriggs (in press) trained pre-service practitioners to interpret data collected through direct behavioral observations but did not train the practitioners on how to collect the data.

1.2 Effective and Feasible Training Practices

To train practitioners to use TDBO, it is necessary to identify training practices that are likely to result in acquisition of target behaviors. With the development of the field of implementation sciences, educational researchers have devoted significant resources to identifying such practices. Specific to early childhood, packages consisting of an initial didactic lecture followed by coaching have emerged as common components within effective trainings (Artman-Meeker, Fettig, Barton, Penney, & Zeng, 2015). Although the sole use of a didactic lecture has consistently been shown to be ineffective for training individuals to implement a target practice with fidelity, they are “an important mechanism for increasing a teacher’s knowledge of intervention practices in preparation for coaching”, as evidenced by 90% of the early childhood coaching literature including an initial didactic

lecture as a component of a training (Artman-meeker et al., p. 187). These didactic lectures commonly take the form of a trainer presenting information in-person to individuals or groups through a PowerPoint presentation. Dependent on the complexity and amount of target behaviors on which individuals are being trained, these lectures may be relatively brief or take-place across multiple days. For example, Shepley, Lane, Grisham-Brown, Spriggs, and Winstead (2017) provided face-to-face didactic lectures in one-to-one arrangements for an average of 40 min per lecture. In contrast, Hemmeter, Snyder, Fox, & Algina (2016) provided lectures to groups across three days for an average of 6.5 hrs per day. For the studies in both these examples, the lectures comprised relatively large proportions of the total time devoted to training activities, with lectures representing approximately 50% of the time devoted to training activities in Shepley and colleagues' study and approximately 40% of the time devoted to training activities in Hemmeter and colleagues' study. As a means of reducing the amount of resources needed to provide effective training, some researchers have used video-conferencing to provide lectures and other training components (Ruble, McGrew, Toland, Dalrymple, & Jung, 2013). Other researchers have created automated training presentations that eliminate the need for an in-person trainer (Lambert, Lloyd, Staubiz, Weaver, & Jennings, 2014).

Regarding active ingredients of practitioner trainings, coaching is considered the primary mechanism whereby behaviors are required. Snyder, Hemmeter, and Fox (2015) define coaching as a "cyclical process for supporting preschool practitioners' use of effective teaching practices that leads to positive outcomes for children" (p. 134). It should be highlighted that this definition views coaching as a process rather than a one-and-done lecture. Furthermore, Snyder and colleagues noted that coaching is cyclical, whereby

training practices are repeated as practitioners make progress towards the acquisition of targeted practices. The training practices used within coaching models vary across studies, however they most commonly incorporate the evidence-based practice of performance-based feedback (Artman-Meeker et al., 2015; Barton & Fettig, 2013; Fallon, Collier-Meek, Maggin, Sanetti, & Johnson, 2015; Fettig & Barton, 2014).

1.2.1 Performance-based Feedback

Performance-based feedback refers to the provision of information about an individual's behavior to the individual (Cooper, Heron, & Heward, 2007). Recommendations and research for providing performance-based feedback suggest that varying combinations of temporal considerations and feedback modalities may be effective. For example, Barton and colleagues (2018) provided performance-based feedback to preschool teachers via email after observing the teachers implement target practices. Ledford and colleagues (2017) provided feedback face-to-face before, during, and after observing paraprofessionals implement target practices. In addition, the components of performance-based feedback often vary across studies, with differing combinations of modeling, role-play, practice, and other components commonly used. Within a series of studies in which training was provided to adults working with preschool-aged children, performance-based feedback was provided through a structured sequence of components following direct observation of the adult's implementation of target practices (Hatcher, Grisham-Brown, & Sese, 2018; Lane, Ledford, Shepley, Mataras, Ayres, & Davis, 2016; Shepley et al., 2017; Zhu, Grisham-Brown, Shepley, & Lane, n.d.). I use the term structured feedback to refer to this specific sequence of feedback components throughout this manuscript.

1.3 Ensuring Generalized Learning of Acquired Behaviors

When teaching children or training practitioners, the ultimate goal is that acquired behaviors will generalize; that is, the behaviors will be used correctly and independently outside of the research context. Generalization of acquired behaviors may occur across time, settings, materials, exemplars, and responses by using various generalization programming methods (Stokes and Baer, 1977). Despite the social significance of ensuring that acquired behaviors generalize and decades of recommendations for how to program for generalization, single-case research has done a relatively poor job of experimentally demonstrating that target behaviors generalize (Kendall, 1981; Neely, Garcia, Bankston, & Green, 2018; Osnes & Lieblein, 2003). Within contemporary design standards for assessing the rigor and effects of single-case research, few provide standards for evaluating generalization (Zimmerman et al., 2018). One set of standards that provides considerations for generalization is the Single-Case Analysis and Design Framework (SCARF; Ledford, Lane, Zimmerman, Chazin, & Ayres, 2016). The SCARF standards place greater significance on evaluations of generalization that occur within the context of a single-case design, rather than through the sole implementation a post-test or pre and post-test. Examples of studies that assessed generalization within the context of single-case designs do exist (e.g., Barton, 2015; Lane, Gast, Ledford, & Shepley, 2017; Ledford & Wolery, 2015; Shepley, Spriggs, Samudre, & Sartini, 2018); however, they commonly target child outcomes. I did not identify any single-case studies that assessed generalized practitioner behaviors within the context of a single-case design; although, there are peer-reviewed recommendations for promoting generalized practitioner behavior (Tillman, 2000).

1.4 Rationale for Proposed Study

There is a need for studies that train preschool teachers in inclusive classrooms to collect TDBO data for monitoring the progress of children requiring tiered supports. Such research would provide the field with a) effective strategies for training teachers to use TDBO, b) feasibility data on the practicality of using such strategies within early childhood MTSS models, and c) social validity data on the acceptability of such practices within inclusive classrooms. In addition, given recommendations from prominent early childhood organizations that progress monitoring within MTSS be sensitive to account for all children's developmental domains (DEC, NAEYC, NHSA, 2013), TDBO may serve as a necessary supplement to measures such as the IGDIs that are restricted to monitoring specific outcomes.

For training teachers to use TDBO, structured feedback is a promising practice. Given the proportion of time commonly devoted to initial lectures when training teachers, additional research on practices that reduce the need for an in-person trainer is warranted (e.g., pre-recorded video-based presentation). Regarding research-based methods of programming for generalization that are functionally related to the generalized performance of acquired behaviors, there are some noteworthy findings in recent research. In a series studies experimentally evaluating generalized learning, researchers identified the presence of multiple exemplar training as a potentially critical component (Shepley, Spriggs, Samudre, & Sartini, 2018; Shepley, Spriggs, Samudre, n.d.). Additional research using multiple exemplar training as a component of teacher training practices is needed within the context of single-case designs to experientially evaluate generalized teacher learning.

1.5 Research Questions

1. Is a training package, consisting of a video-based presentation and structured feedback, functionally related to teachers' generalized implementation of TDBO procedures across children and outcomes?
2. What is the average amount of time allotted to teacher training activities for a teacher to reach mastery criterion with TDBO procedures?
3. How do teachers rate the social and ecological validity of the TDBO procedures and training package across time?

CHAPTER 2. METHOD

2.1 Participants and Setting

2.1.1 Teachers

Participants for this study were recruited from a university-based preschool located in the southeastern United States. The preschool housed one publicly funded preschool program with a federally funded Head Start partnership, and the following tuition-based classrooms: a) 0-1 years old, b) 2-3 years old, and c) two pre-kindergarten classrooms for children 3-5 years old. All classrooms were staffed with a licensed early childhood educator. This site was selected given that all classrooms met criteria used in past research as indicators of an early childhood program's readiness to employ tiered support systems (Buysee et al., 2016; Koutsoftas, Harmon, & Gray, 2009). The criteria relevant to this study were: a) a curriculum in place to identify learning outcomes for all children, b) outcomes for all children measured using a validated instrument aligned with the curriculum, c) data collected on all children's learning outcomes at least twice during the school year, d)

classroom teachers have or are working towards degrees related to early childhood education, and f) at least one teaching assistant present during the entire school day. It should be noted that there was not an established or standardized tiered support system used within the preschool. Rather, teachers were encouraged to scaffold instruction for each student. In addition, at the beginning of the school year teachers in collaboration with children's family members selected individualized goals to work on with each child throughout the school year. The educational philosophy of the preschool emphasized developmentally appropriate practice while utilizing a blended practices approach to instruction. For example, teachers used authentic assessment practices, embedded instruction within classroom activities and routines, and structured the school day with a combination of teacher and child led activities. Refer to Table 1 for additional information on the classrooms.

Following a presentation about the study, given during a staff meeting at the preschool or after an individual meeting with a preschool teacher, four teachers volunteered to participate. Two teachers, Kris and Mary, were lead teachers in inclusive preschool classrooms serving children that were 3-5 years old, and both teachers had a master's degree in interdisciplinary early childhood education. The other participants, Leah and Carl, were assistant teachers assigned to Kris or Mary's classroom; Leah worked in Kris's classroom and Carl worked in Mary's classroom. Leah and Carl were graduate students working towards degrees in interdisciplinary early childhood education. Refer to Table 2 for additional information on the teachers. Refer to Appendix A for the institutional review board teacher consent document.

2.1.2 Children

After teachers consented to participate, 12 children were recruited for participation (6 in each classroom). Refer to Table 3 for children's demographic information. The children were selected based on their performance on classroom-wide learning outcomes relative to their peers (i.e., local norms). As part of the established education program provided at the preschool, all children's learning outcomes were measured by their classroom teachers using the Assessment, Evaluation, and Programming System, Three to Six Year, Second Edition (AEPS; Bricker et al., 2002). The AEPS is a CBA designed to provide program planning information for children between the ages of three and six years old. Documents requesting parental permission for participation were sent home with children scoring in the bottom 25% of at least one of the following areas on the AEPS: a) Area A - Concepts, b) Area G - Premath, or c) Area H - Phonological Awareness and Emergent Reading. These areas were selected given that they are comprised of skills that are consistently targeted within evaluated early childhood tiered support systems (Shepley & Grisham-Brown, 2019). Once permission was obtained for 12 children, 3 children in the same classroom were randomly assigned to a teacher in that classroom so that one child in the bottom 25% of each AEPS area was assigned to each teacher. In addition, within each set of three children assigned to a teacher, two of the children were randomly assigned as target children and one child was randomly assigned as a generalization child. The sole difference between a target and generalization child was that a generalization child's assigned teacher did not receive structured feedback during the teacher training condition when working with the generalization child (see Experimental Design section). Randomization of teacher and child assignments was done using Microsoft Excel's random function. Refer to Table 4 for assignment information on children. Refer to

Appendix B for the institutional review board parental consent for child participation document.

2.1.3 Trainer

I served as the trainer for all teachers. The trainer was a board certified behavior analyst with a master's degree in special education focusing on moderate to severe disabilities. The trainer was currently enrolled in a special education doctoral program with an emphasis in interdisciplinary early childhood education. Prior to returning to graduate school, the trainer worked in public schools for seven years with the majority of that time as a preschool special education teacher in a self-contained classroom. It should be noted that the trainer also had experience conducting applied research on training teachers and caregivers to implement research-based practices with children with, or at-risk for developmental delays.

2.2 Dependent Variables

2.2.1 Child Behaviors

To determine behaviors on which to assess children during study sessions, each child's classroom teacher reviewed a child's AEPS data. Using this data in conjunction with the area in which a child qualified for the study (e.g., Concepts), the classroom teacher selected a behavior that was specific to each child's needs and meaningful to the child (McWilliam, 2009). Following the selection of a behavior, the trainer had the teachers select target pieces of information on which to assess the children during sessions. For behaviors that focused on a discrete skill, 10 targets were selected, and for behaviors

focusing on chained skills, 5 targets were selected. Refer to Table 5 for information on selected child behaviors and targets.

2.2.2 Teacher Behaviors

Teachers were assessed on their ability to use TDBO to monitor child progress. Although researchers have utilized TDBO in studies for decades, there is not a packaged or formalized set of procedures for using these strategies. Rather, researchers have typically developed procedures that are unique to their study's parameters (e.g., setting, implementer, dimension of behavior under investigation). To develop a single set of procedures that is robust to account for all child behaviors being measured by classroom teachers in this study, I used Lawshe's (1975) content validity method to determine essential procedures that should be included when using TDBO for progress monitoring purposes. First, I compiled a list of procedures commonly employed in research and practice. This list was given to a convenience sample of ten professionals working in the field of early childhood special education. These professionals worked as researchers and teacher educators at institutes of higher education; consultants serving teachers, families, and young children with special needs; or preschool special education teachers. All professionals had published peer-reviewed research involving TDBOs and were board certified behavior analysts. Second, seven of the professionals agreed to rate each of the procedures on the list as 1=essential, 2=useful but not essential, or 3=not necessary for conducting TDBO in preschool classrooms (see Appendix C for a copy of the survey). Third, I used the ratings to calculate Lawshe's content validity ratio (CVR) for each rated procedure. The formula was as follows:

$$CVR = \frac{N_{essential} - N_{other}}{N_{other}}$$

$N_{essential}$ is the number of professionals rating a procedure as essential and N_{other} is the number of professionals rating the procedure as useful but not essential or not necessary. A ratio greater than 1.0 indicated that the majority of professionals agreed that a procedure was essential to TDBOs. A ratio of 2.0 indicated that all professionals rated a procedure as essential. All procedures with a CVR greater than 1.0 were included in the TDBO measure used in this study. In total, teacher implementation of 15 TDBO procedures were measured, with 6 of those procedure receiving a CVR of 2.0. Refer to Appendix D for a description of each procedure included in the measure.

2.2.2.1 Modifications

One procedure that received a CVR less than 1.0 was included in the measure (i.e., *All target pieces of information receive at least one trial during an assessment*). This procedure was included due to their being an error its description on the list of procedures provided to professionals. In addition, during the training of reliability data collectors there were consistent disagreements when coding procedures described as needing a teacher to engage in a certain behavior for *approximately 80% of trials*. To better ensure reliable data collection, I changed these procedures to indicate that a teacher needed to engage in behaviors for *100% of trials*.

2.3 Independent Variable

The independent variable in this study was a teacher training package provided by the trainer. The package consisted of a) a video-based multimedia presentation on TDBO

procedures and b) structured feedback. The video-based presentation was created by the trainer specifically for this study. Using pictures, video clips, and audio narration, the presentation provided a series of examples and or non-examples specific to each of the identified essential procedures. The video was 10 min in length, hosted on YouTube, and viewable solely through a private link in possession of the trainer. Refer to Appendix E for a QR code and link to the view the video.

Structured feedback consisted of the following sequence of components provided to teachers immediately after specific sessions in which they engaged in the TDBO procedures: a) behavior specific praise provided in relation to procedures implemented correctly, b) corrective feedback provided on procedures implemented incorrectly, c) teacher provided with an opportunity to observe a model of procedures, d) teacher provided with an opportunity to role-play procedures with the trainer, and e) teacher provided with an opportunity to ask questions.

2.4 Data Collection and Measurement

All primary data were collected by the trainer using pen and paper in the classrooms as behaviors occurred (see Appendix F for a copy of the data sheet). Reliability data were collected in the same manner by secondary data collectors (see Reliability section for further information). Teacher performed TDBO procedures were scored as correct, incorrect, or not applicable. Refer to Appendix D for operational definitions of behaviors indicating correct performance for each TDBO procedure. Any non-occurrence or deviation from the definitions of correct performance resulted in a procedure being scored as incorrect. Procedures were scored as not applicable if there was no opportunity for them to occur. For example, if a child answered all questions incorrectly during an assessment,

then there was no opportunity for a teacher to provide behavior specific praise related to child responding. Data were also collected on child responses during study sessions. Responses were scored as correct, incorrect, or unsure. For expressive identification behaviors, a correct response was scored if a child vocally articulated the label for a target stimulus. For receptive identification behaviors, a correct response was scored if a child touched a target stimulus with their finger or hand. For counting behaviors, a correct response was scored if a child vocally articulated the corresponding number for each counted item until all items were counted. Incorrect responses occurred if a) a child's response deviated from the correct response topography, b) the child did not respond within 5 s of a question, or c) the child indicated to the teacher that they did not know. If a data collector did not hear a child's response for a given teacher-presented question, the data collector scored a response as unsure. Refer to Appendix F for a copy of the data sheet.

As a measure of the dosage of teacher training provided, the duration in minutes of teacher training activities was measured. This was measured by writing down the start and end time of each activity. These activities included a) video-based presentation overview, b) direct observation, c) structured feedback, and d) waiting. Video-based presentation overview referred to information provided by the trainer to a teacher, which related to how and by when the teacher should watch the video-based presentation. Direct observation referred to the observation of a teacher by the trainer when a teacher was engaged in a study session. Structured feedback occurred during the provision of feedback components by the trainer to the teacher following direct observation. Waiting referred to the time between planned training activities and study sessions within a teacher's classroom. For

example, the amount of time that passed once the trainer arrived at a teacher's classroom and the teacher began a session with a child was considered a waiting activity. In addition, the amount of time following the provision of structured feedback and a teacher's next scheduled session for a day was considered a waiting activity if the next session was scheduled immediately after the previous one. Refer to Appendix F for a copy of the data sheet.

2.4.1 Social and Ecological Validity Questionnaire

Teachers completed a researcher-created social and ecological validity questionnaire throughout the study. The questionnaire was adapted from Shepley et al. (2017) with consideration of recommendations provided by Ledford, Hall, Conder, and Lane (2016). Specifically, a combination of objective and subjective measures was included in the questionnaire. The objective measures (n=7) used a researcher-created rating scale and the subjective measures (n=3) were open-ended questions. Ratings resembled a Likert-type scale with 3 integer values provided for each question. Lower values indicated less evidence of social or ecological validity and higher values indicated greater evidence of social or ecological validity. Ratings for questions 1-5 pertained to ecological validity and questions 6-7 pertained to social validity. Questions 8-10, which allowed for open-ended responses, addressed future changes that teachers recommend be made concerning the training package components and content on which the teachers were trained. The questionnaire is included in Appendix G.

2.5 Procedures

Study sessions were conducted up to four days per week for three months. A session occurred when a teacher assessed a child on their selected behavior. Sessions always occurred in the classroom setting with classroom peers present. The materials used during each session were determined by the teacher, with no input from the trainer, and often related to the activity a child was currently playing (e.g., using a puzzle with pieces that depicted numerals when assessing numeral labeling). Therefore, materials frequently varied from session to session for each child. Unless a student was absent, teachers engaged in three sessions per day; one with each child assigned to them. The trainer scheduled weekly sessions with teachers during times that the teachers indicated they would typically engage in data collection as needed (e.g., gathering information for AEPS assessments). For all teachers except Leah, these times were during center-based free play. For Leah, session times occurred immediately after lunch and as children were preparing for rest time. Given the dynamic nature of preschool classrooms, the specific sequence in which children were assessed was determined by the teachers on a day-by-day basis; thus the daily sequence of sessions was not conducted in a randomized order. Data were collected on teacher and child behaviors, as well as durations of training activities surrounding each session. Sessions occurred across three different conditions: a) probe, b) teacher training, and c) maintenance.

2.5.1 Probe Condition

Probe sessions occurred prior to a teacher receiving any training (i.e., video-based presentation or structured feedback) on TDBO procedures. Before the start of a session, the trainer reminded a teacher of the behavior on which the child should be assessed. Once

a teacher indicated that he or she was ready, a session started. The trainer provided no prompting or feedback to the teacher before, during, or after a session. Probe sessions ended once a teacher indicated that they were finished or the teacher dismissed the child from the area. There was not a set duration for probe sessions.

2.5.2 Teacher Training Condition

Immediately after a teacher's final probe session, the trainer provided the teacher with the video-based presentation. This was done through a handout that contained a QR code that may be scanned using a smart device to view the video. In addition, a link to the video was emailed to the teacher that same day. The handout provided a description and example of each of the TDBO procedures (see Appendix H). The trainer told the teachers to watch the video in a distraction-free environment. No additional sessions were conducted with a teacher until they confirmed that they viewed the video. Once sessions resumed, the trainer provided structured feedback after each session with an acquisition child, and no prompting or feedback was provided before or during sessions. The provision of structured feedback did not have a set duration. No structured feedback was provided following sessions with a generalization child.

2.5.3 Maintenance Condition

Maintenance sessions were identical to probe sessions, in that there was no prompting or feedback provided before, during, or after study sessions.

2.5.4 Generalization

Teachers' implementation of TBDO procedures with generalization children were collected across all probe, teacher training, and maintenance conditions. During probe and maintenance conditions, sessions with generalization children were identical to session with acquisition children (i.e., no structured feedback provided). During teacher training conditions, sessions with generalization children difference form sessions with acquisition children. Specifically, no structured feedback was provided following a session with a generalization child.

2.6 Experimental Design and Analysis

A single-case multiple probe design across teachers was used to answer the first research question (i.e., Is a training package, consisting of a video-based presentation and structured feedback, functionally related to teachers' generalized implementation of TDBO procedures across children and outcomes?). The dependent variable guiding experimental decisions was the percentage of TDBO procedures performed correctly by the teachers. Mastery criterion for teachers was set at 93.3% of all TDBO procedures implemented correctly and 100.0% procedures receiving a CVR of 2.0 implemented correctly. This criterion allowed for one incorrectly implemented procedure, as long as it was not rated by all professionals as essential. In addition, teachers needed to meet the criterion for three consecutive sessions with acquisition children. Following a teacher reaching the mastery criterion, training began with the next teacher. It should be noted that data were to be collected for at least four sessions with each child in each condition, to adhere to contemporary design standards (e.g., What Works Clearinghouse [2017]). Therefore, if a teacher reached mastery criterion prior to each child receiving four sessions,

additional sessions continued with the teacher and children. The sequence in which teachers received training was initially determined using Microsoft Excel's randomize function. However, due to scheduling conflicts with Carl and Leah's assigned children, the trainer determined that Carl and Leah move to tiers three and four within the design. This move was made to ensure to better ensure that there would be at least three attempts to demonstrate an effect prior to the end of the school year, which would also be the end of the study. An a priori determination was made that a minimum of three sessions be conducted with each child in each condition in order to increase the likelihood that the study meet contemporary design standards. Data were visually analyzed with consideration of level, trend, variability, overlap, immediacy of effect, and consistency of effect across similar conditions. Due to the number of sessions being conducted each day for each teacher and to facilitate visual analysis, all sessions occurring on the same day were graphed on the same value of the abscissa.

To answer the second research question (i.e., What is the average amount of time allotted to teacher training activities for a teacher to reach mastery criterion with TDBO procedures?), means across each training activity were examined individually and collectively for teachers. To answer the third research question (i.e., How do teachers rate the social and ecological validity of the study content and procedures across time?), teacher ratings and responses on the social and ecologically questionnaire were completed at two time points throughout the study. The first time point occurred after a teacher's first day of receiving structured feedback, and the second occurred after mastery of the TDBO procedures. Means of teacher ratings were calculated separately for questions pertaining to ecological validity and questions pertaining to social validity for each completed

questionnaire. Bar graphs were created to display changes in teacher ratings form the first and second time points. I analyzed responses on open-ended questions for consistent themes expressed across teachers.

2.6.1 Reliability

Reliability data were collected in-vivo by two graduate students blind to the study purpose and conditions. One student was trained to collect data on teacher and child behaviors (i.e., interobserver agreement data). Refer to Appendix I for a copy of the interobserver agreement data sheet. This student was not provided any information about procedures in which the trainer would engage (i.e., the study's independent variable of the teacher training package). In addition, after each session, the student left the classroom so as not to observe the trainer providing structured feedback. The student left the classroom for all sessions, regardless of whether the trainer actually provided structured feedback (e.g., following a teacher's probe session). Interobserver agreement percentages (i.e., reliability of the study's dependent variables) were calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. An agreement was defined as the trainer and secondary data collector providing the same code for a teacher procedure or child response (e.g., correct, incorrect). A disagreement occurred if the codes differed.

The second graduate student was trained to collect data on the trainer's behaviors (i.e., procedural fidelity) and durations of training activities. Refer to Appendix J for a copy of the procedural fidelity data sheet. A total of ten trainer behaviors were identified that the trainer should engage in at different points in the study based on the teacher, condition, and child for a given session. These trainer behaviors were as follows: a)

informs teacher of the child and related behavior, b) behavior specific praise provided to teacher, c) corrective comments given, d) provides opportunity to watch model of correct implementation, e) provides opportunity to role-play with teacher, f) provides opportunity to ask questions, g) no other prompting or feedback provided, h) tells teacher that a link to a video will be emailed to the teacher, i) instructs teacher to watch the video in a distraction-free environment, and j) provides a handout to the teacher. The student collected data on the trainer's engagement in all the listed behaviors prior to, during, and after a session; therefore, the student scored if the trainer engaged in 30 behaviors during each session. After each day in which the second student collected data, I compared the student's data to a key that indicated the planned behaviors that the trainer should and should not have performed based on the teacher, condition, and student for that session. The key for each condition and child is presented in Appendix K. A procedural fidelity percentage (i.e., reliability of the independent variable) was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. An agreement was defined as the student data collector providing the same code as indicated on the key for a given session. Disagreements occurred if the codes differed.

Reliability of the duration of training activities was calculated using point-by-point agreement. That is, any durations collected by the trainer and student that were within 1 minute of each other were considered an agreement for a training activity. The percentage of training activities with agreements for each session was calculated by diving the number of agreements by the number of agreements plus disagreements and multiplying by 100. In addition, as a supplemental reliability measure, total duration agreement was used for the total duration of each session. Total duration agreement percentages were calculated

by dividing the smaller duration collected by one of the data collectors by the larger duration and multiplying by 100.

Table 2.1 Classroom Information

Lead Teacher	Ratio[a]	# Children	# Boys	# Girls	# Minority	# DLL	# IEP	# Private services[b]
Mary	1:8	18	10	8	7	1	2	0
Kris	1:6	18	8	10	7	4	1	2

Note. [a]typical ratio of adults to children; [b]refers to children that received speech, occupational therapy, physical therapy, or hearing and vision services privately; DLL=dual language learner, IEP=child has an individualized education plan

Table 2.2 Participating Teacher Information

	Mary	Kris	Carl	Leah
Age (yr)	26	40	28	29
Sex	F	F	M	F
Ethnicity	Caucasian	Caucasian	Caucasian	Asian
# years working as lead teacher	4	13	0	0
# years working in early childhood classrooms	8	17	4	4

Table 2.3 Participating Child Information

Child	Assigned teacher	Age (m)	Sex	Ethnicity	DLL	Evaluated[a]	Private services[b]
1	Mary	52	F	Caucasian	No	No	No
2	Mary	51	M	Caucasian	No	No	No
3	Mary	49	M	Multi-cultural	No	No	No
4	Kris	39	M	Caucasian	No	Yes	Yes
5	Kris	39	M	Caucasian	No	No	No
6	Kris	39	F	Caucasian	No	Yes	Yes
7	Carl	55	F	Hispanic	Yes	No	No
8	Carl	57	F	Multi-cultural	No	No	No
9	Carl	57	F	Multi-cultural	No	No	No
10	Leah	46	F	Asian	Yes	No	No
11	Leah	47	F	Multi-cultural	No	No	No
12	Leah	41	F	Asian	Yes	No	No

Note. [a]indicates if the child has ever been referred or evaluated for early intervention or special education services; [b]child receives speech, occupational therapy, physical therapy, or hearing and vision services privately; Multicultural=child was from a family in which the primary caregivers were different ethnicities

Table 2.4 Child Assignment and Qualifying Area

Teacher	Child	Assignment	Area Qualified
Mary	1	Acquisition	PA and ER
	2	Acquisition	Premath
	3	Generalization	Concepts
Kris	4	Acquisition	Premath
	5	Acquisition	Concepts
	6	Generalization	PA and ER
Carl	7	Acquisition	PA and ER
	8	Acquisition	Concepts
	9	Generalization	Premath
Leah	10	Acquisition	PA and ER
	11	Acquisition	Concepts
	12	Generalization	Premath

Note. PA and ER=Phonological Awareness and Emergent Reading

Table 2.5 Child Behaviors and Targets

Child	Behavior	Targets	Example
1	Expressive labeling of letter sounds	A, U, D, R, E, Y, V, L, N, B	What sound does that letter make?
2	Expressive labeling of numerals	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	What number is that?
3	Receptive creation of spatial relations	between, back of, under, middle, beside	Put the block between the towers.
4	Counting objects	4, 5, 6, 7, 8	How many cars are there?
5	Expressive labeling of colors and shapes	circle, triangle, square, heart, star, green, yellow, red, purple, pink	What shape is that?
6	Receptive identification of letters	C, O, R, A, G, E, T, K, L, S	Which one is letter T?
7	Expressive labeling of letters	P, A, U, L, B, C, D, E, S, T	What letter is that?
8	Receptive identification of qualitative and quantitative concepts	sour, rough, bumpy, smooth, sweet, spicy, lots, empty, few, couple	Which one is bumpy?
9	Expressive labeling of numerals	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	What number is that?
10	Expressive labeling of letters	R, N, E, P, I, S, M, D, U, G	What letter is that?
11	Expressive labeling of colors and shapes	triangle, square, rectangle, diamond, orange, brown, purple, gray, white, black	What color is that?
12	Receptive identification of numerals	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	Which one is number 4?

CHAPTER 3. RESULTS

3.1 Rigor

For three of the four participating teachers, the independent variable was systematically applied; therefore, there were three attempts to demonstrate an effect within the single-case experimental design. For one teacher, Leah, the independent variable was not applied; however, probe sessions were conducted with her and her assigned children throughout the study. Data were collected across two conditions for each teacher receiving training (i.e., probe and teacher training conditions), and there were at least four data points across acquisition children and four data points for the generalization child assigned to each teacher in each condition. For two teachers, Mary and Kris, data were also collected in the maintenance condition. During the probe condition of the first tier in the design, there was at least one overlapping data point in all subsequent tiers. Within all probe conditions for each teacher, there were at least three data points for each assigned child. Immediately prior to each teacher receiving training, at least one probe session was conducted with each child assigned to the teacher awaiting training. Within one to two sessions of Mary, Kris, and Carl reaching the mastery criterion, a probe or maintenance session was conducted with all other teachers. For all teachers and children, there was never more than eight data collection days that passed without a probe or maintenance session occurring.

Interobserver agreement data for teacher's implementation of TDBO procedures, child responses, and durations of training activities were collected for at least 25% of sessions within each teacher's probe and teacher training condition. Mean interobserver agreement of TDBO procedures was at least 85% for each child in each condition. For

durations of training activities, mean interobserver agreement for point-by-point estimates was above 80% for each child in probe and teacher training conditions. Interobserver agreement data were not collected on durations of teacher training activities during any teachers' maintenance condition. Refer to Table 6 and Table 7 for further information on interobserver agreement data. Procedural fidelity of trainer behaviors was collected for at least 25% of sessions with each teacher and child within each condition, except for maintenance sessions during which no procedural fidelity data were collected. Mean procedural fidelity percentages across condition, teachers, and children were at least 90%. Refer to Table 8 for information on procedural fidelity data.

This study meets all single-case design standards established by What Works Clearinghouse (2017) to allow for an examination of the effect of the independent variable applied in the teacher training condition following the probe condition.

3.2 Teacher-directed Behavioral Observation Procedures

Throughout each probe condition, teachers engaged in at least 26.7% of the TBDO procedures, and no teacher implemented TBDO procedures at criterion levels. The magnitude of variability in each teacher's probe data varied with Kris's data showing the greatest variance when analyzed as range (26.7-71.4 percentage points [PP]) and Carl's showing the greatest when analyzed as standard deviation (9.8PP). Incorrectly implemented procedures during the probe condition varied within and across teachers. Prior to introducing training, each teacher's data was stable with no apparent trend. In addition, following the introduction of training for each teacher, the teacher data in probe conditions awaiting training remained stable (i.e., no observable covariation).

Upon the introduction of training, absolute level changes nearing criterion levels were observed for Mary and Kris across their assigned children. There was no meaningful absolute level change observed for Carl's data upon the introduction of teacher training. For teachers receiving the training, there was one session following the video-based presentation that occurred prior to receiving any structured feedback. For this session, both Mary and Kris engaged in TBDO behaviors at a level above all their probe sessions. In contrast, Carl's data displayed an accelerating trend across three data collection days prior to reaching mastery criterion level. Maintenance data for Mary and Kris remained at criterion levels. Leah's probe data remained stable and below criterion levels throughout the study. Regarding implementation of procedures when working with a generalization child, visual analysis does not suggest any meaningful differences across conditions when compared with implementation when working with acquisition children.

It should be noted that participating teachers awaiting training, were typically present in a classroom when another teacher was receiving training. For example, Leah was always in the classroom throughout Kris's training sessions. By collecting data on Leah's performance before, throughout, and following Kris's training sessions, contamination effects (also referred to as history effects) can be detected. Given that Leah's data has remained stable and she has not received the intervention, this provides support that there have not been contamination effects.

3.3 Training Durations

Teachers received a mean of 86 min (range=60-109 min) of training. On average, waiting had the greatest duration of the training activities (M=37 min), followed by direct observation (M=26 min), structured feedback (M=21 min), and lastly, overviewing the

video-based presentation (M=3 min). When omitting waiting activities, teachers received a mean of 49 min of training (range=34-52 min). Refer to Table 9 for additional information on the durations of training activities.

3.4 Social and Ecological Validity

Social and ecological validity ratings were relatively high across all teachers and time points. The mean rating of social validity questions across all teachers at the first time point was 2.7, and the mean rating at the second time point was 3.8. For ecologically validity questions, the mean rating across all teachers at the first time point was 3.0 and the mean rating at the second time point was 3.0. There was not a decrease in the rating of any question for any teacher across time points. Regarding subjective measures allowing for open-ended response, two teachers expressed comments relating to their acceptability of the video as a component of the training package. For example, Kris noted, “The video was short, yet very informative.”, and Mary noted, “Video was great, very helpful”. It should be noted that Carl returned only one questionnaire, and Leah did not complete any questionnaires due to her not receiving the training.

Table 3.1 Interobserver agreement information for teacher-directed behavioral observation procedures

		Condition		
Teacher	Child	**Probe**	**Teacher Training**	**Maintenance**
Mary	1	100 / 25	96.7 / 25	100 / 100
	2	100 / 25	96.7 / 25	96.7 / 100
	3	100 / 25	100 / 25	90.0 / 100
	All	100 / 25	97.8 / 25	95.6 / 100
Kris	4	93.2 / 75	85.7 / 25	n/a
	5	91.1 / 75	100 / 25	100 / 100
	6	91.1 / 75	100 / 25	n/a
	All	91.8 / 75	95.2 / 25	n/a
Carl	7	90.0 / 50	100 / 25	n/a
	8	93.3 / 25	100 / 50	n/a
	9	93.3 / 40	86.7 / 25	n/a
	All	92.2 / 38.4	95.6 / 33	n/a
Leah	10	100 / 60	n/a	n/a
	11	93.3 / 60	n/a	n/a
	12	88.9 / 60	n/a	n/a
	All	94.1 / 60	n/a	n/a

Note. First number in a cell is the mean percentage of correctly implemented teacher-directed behavioral observation procedures and the second number is the percentage of sessions in which reliability data were collected; n/a=not applicable due to that participant or child not receiving sessions for that particular condition

Table 3.2 Interobserver Agreement Information for Durations of Teacher Training Activities

		Condition		
Teacher	Child	**Probe**	**Teacher Training**	**Maintenance**
Mary	1	100 / 87.5 / 25	100 / 100 / 25	not collected
	2	100 / 75.0 / 25	100 / 100 / 25	not collected
	3	100 / 100 / 25	100 / 100 / 25	not collected
	All	100 / 87.5 / 25	100 / 100 / 25	not collected
Kris	4	100 / 100 / 25	100 / 92.9 / 25	n/a
	5	100 / 100 / 25	100 / 87.5 / 25	not collected
	6	100 / 100 / 25	100 / 91.7 / 25	n/a
	All	100 / 100 / 25	100 / 90.7 / 25	not collected
Carl	7	100 / 100 / 25	83.3 / 89.9 / 50	n/a
	8	83.3 / 89.2 / 50	100 / 93.75 / 50	n/a
	9	100 / 79.1 / 40	100 / 95.0 / 50	n/a
	All	94.4 / 94.4 / 38	94.4 / 92.9 / 50	n/a
Leah	10	100 / 91.7 / 50	n/a	n/a
	11	100 / 81.2 / 50	n/a	n/a
	12	100 / 100 / 50	n/a	n/a
	All	100 / 91.0 / 50	n/a	n/a

Note. First number in a cell is mean percentage agreement of for all training activities across a child's sessions, second number is the mean percentage of total duration agreements across a child's sessions, and third number is the percentage of sessions for which reliability data were collected for teacher training activity durations; n/a=not applicable due to that participant or child not receiving sessions for that particular condition

Table 3.3 Procedural Fidelity Information for Trainer Behaviors

		Condition		
Teacher	Child	**Probe**	**Teacher Training**	**Maintenance**
Mary	1	100 / 25	96.7 / 25	not collected
	2	100 / 25	96.7 / 25	not collected
	3	100 / 25	100 / 25	not collected
	All	100 / 25	97.8 / 25	not collected
Kris	4	100 / 25	96.7 / 25	n/a
	5	96.7 / 25	96.7 / 25	not collected
	6	100 / 25	100 / 25	n/a
	All	98.9 / 25	97.7 / 25	not collected
Carl	7	93.3 / 25	96.7 / 50	n/a
	8	96.7 / 50	100 / 50	n/a
	9	98.3 / 40	96.7 / 50	n/a
	All	96.1 / 38	97.8 / 50	n/a
Leah	10	100 / 50	n/a	n/a
	11	98.3 / 50	n/a	n/a
	12	96.7 / 50	n/a	n/a
	All	98.3 / 50	n/a	n/a

Note. First number in a cell is the mean percentage of correctly implemented behaviors by the trainer and the second number is the percentage of sessions in which procedural fidelity data were collected; n/a=not applicable due to that participant or child not receiving sessions for that particular condition

Table 3.4 Durations in Minutes of Teacher Training Activities During the Teacher Training Condition for Participants Reaching Mastery Criterion

		Activity				
Teacher	Child	**Video Overview**	**Waiting**	**Direct Observation**	**Structured Feedback**	**Total**
Mary	1	0	12	6	7	25
	2	0	6	7	5	15
	3	3	8	6	0	17
	Total	3	26	19	12	60
	Mean	1	9	6	4	19
Kris	4	0	12	10	13	35
	5	0	10	13	11	34
	6	2	7	13	0	20
	Total	2	29	36	24	89
	Mean	1	10	12	8	30
Carl	7	3	15	8	22	48
	8	0	16	7	5	28
	9	0	26	7	0	33
	Total	3	57	22	27	109
	Mean	1	19	7	9	36
Total duration across all children		8	112	77	63	258
Mean duration across all children		1	12	8	7	29

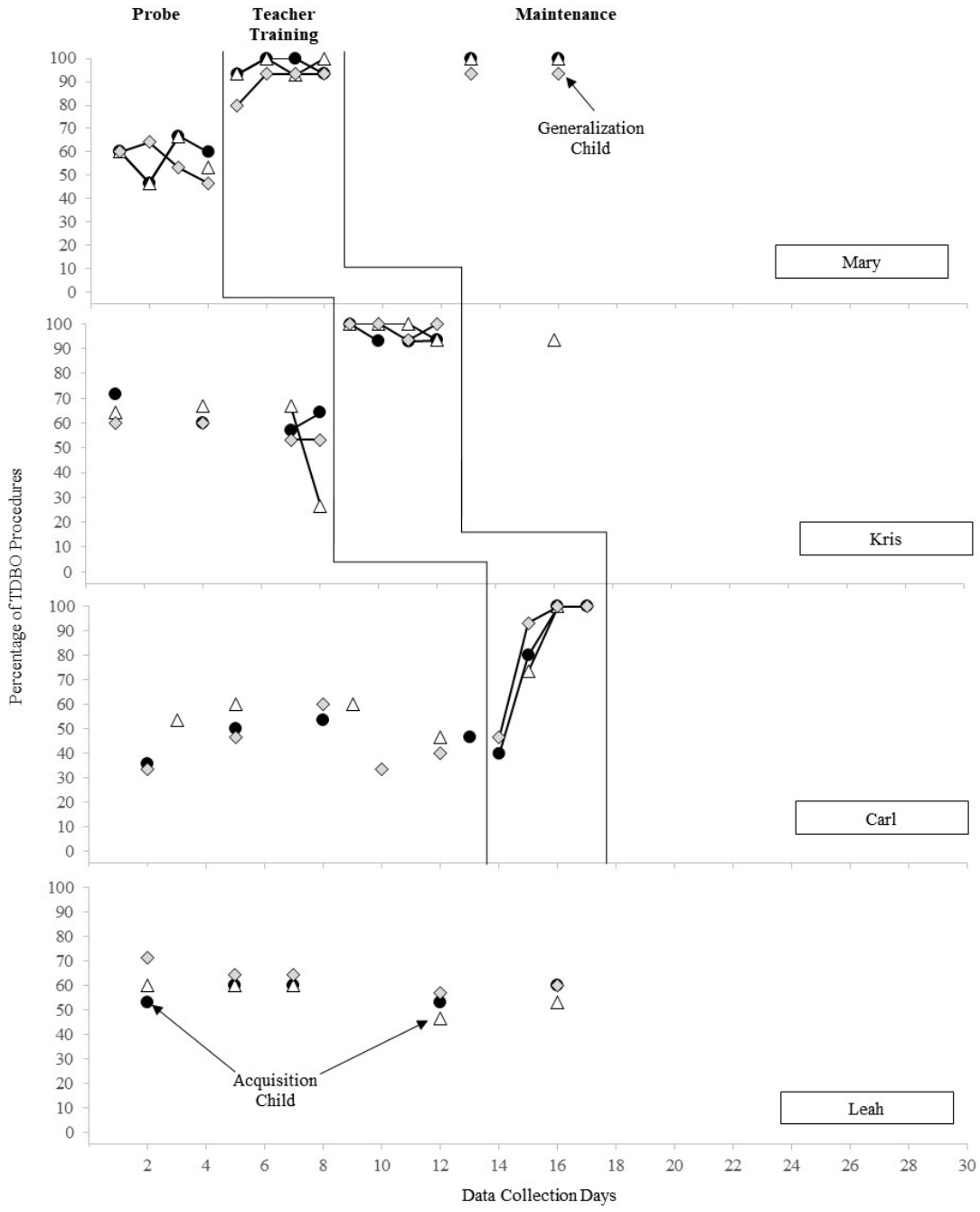

Figure 3.1 Percentage of Teacher-directed Behavioral Observation Procedures Implemented Correctly Across Data Collection Days for Each Teacher

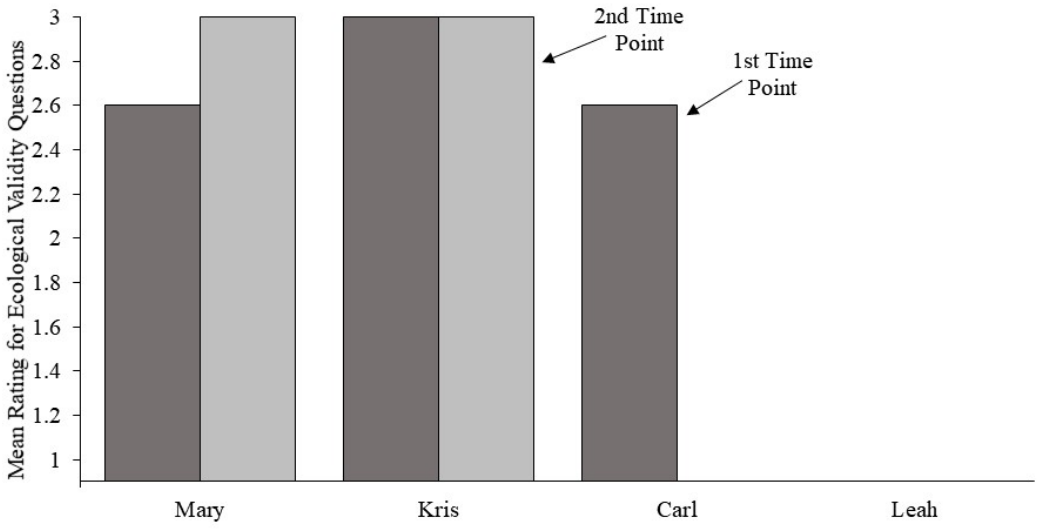

Figure 3.2 Teachers' Mean Rating on Ecological Validity Questions Across Time Points

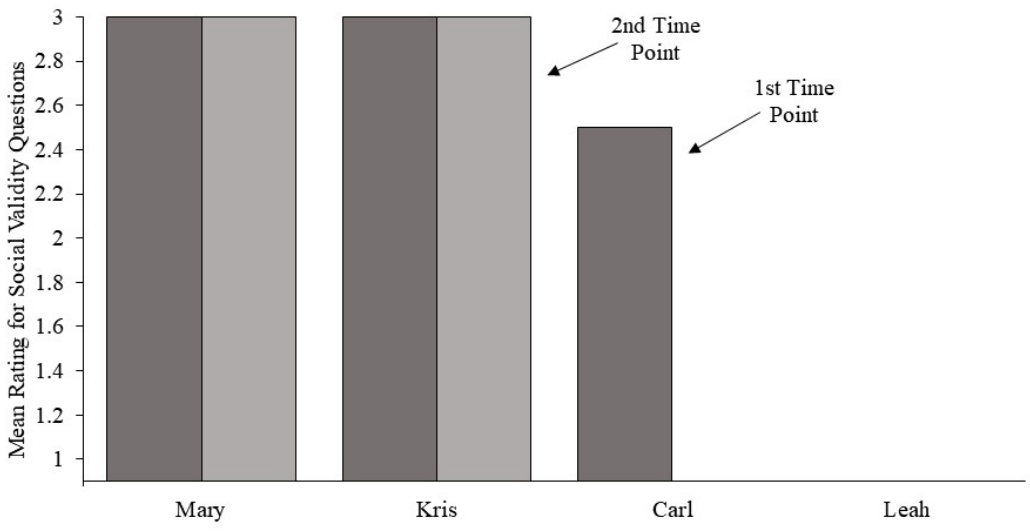

Figure 3.3 Teachers' Mean Ratings on Social Validity Questions Across Time Points

CHAPTER 4. DISCUSSION

This study evaluated the effectiveness of a training package on preschool teachers' generalized implementation of TDBO procedures when monitoring children's progress on academic behaviors. Visual analysis of the graphed data indicate that the training package was effective for three teachers, with a functional relation established between the training practices and the teachers' implementation of TDBO procedures. In addition, despite teachers awaiting intervention and being in the same classroom as other teachers currently receiving training, there were no detected effects of this exposure, which suggests that teachers should not be expected to perform TDBO procedures without training. All teachers acquired the behaviors within four data collection days. One explanation for the relative efficiency in which teachers achieved mastery criterion levels of implementation, may be due to the teachers implementing the TBDO procedures at relatively high rates prior to receiving any training; thus, the teachers only needed to acquire some of the TDBO procedures to achieve mastery. Examining the early childhood teacher training literature provides minimal research for which to compare these acquisition rates, as nearly all other early childhood teacher training studies target the implementation of instructional strategies or behavioral interventions as the dependent variable. Given a lack of research on training teachers to implement progress monitoring strategies, this study may provide guidance for future researchers and current practitioners. In addition, given that modifying intervention based on progress monitoring data is foundational to MTSS, future evaluations of MTSS in early childhood settings should consider using or expanding on the training practices examined in this study to prepare teachers to collect data at higher tiers of support systems.

Concerning the training practices used in this study, the results suggest that video-based presentation may be effective at providing context for future teacher coaching (i.e., the provision of structured feedback across sessions and days). Due to the minimal amount of resources needed to deliver the video-based presentation to teachers (i.e., an average of 3 min per teacher and an email with a link to the video), professional development providers may consider exploring this option in conjunction with ongoing coaching and feedback when working with teachers. In addition, providers of professional development that utilize in-vivo on-going feedback should consider the extent to which time is spent waiting to observe teachers engaging in target procedures, and make adjustments to minimize this amount of time.

Regarding social and ecological validity, teachers generally rated the TBDO procedures and training components favorably. Different from past research that evaluated social and ecological validity across time points (Shepley et al., 2017), no meaningful differences were observed across teachers' ratings in this study. This is likely, in part, due to generally favorable ratings being provided at the first time point and thus additional ratings, although descriptively higher, encountered a ceiling effect with the 1-3 integer-value rating scale. Teacher responses on open-ended questions were positive about the video. I hypothesize that the flexibility offered by the video influenced the teacher's positive perception of the video as a training component. For example, the teachers could watch the video at a time of their choosing and on a device of their choosing (e.g., computer, tablet, smart phone). As research on teacher training practices evolves beyond what works for whom and under what conditions, researchers may consider looking at the impact of teacher preference on how trainings are received. This notion of teacher

preference impacting training has been discussed with regard to feedback (e.g., Barton, Kinder, Casey, & Artman, 2011), but minimal discussion has occurred with regard to other training practices (e.g., lectures, visual supports).

4.1 Limitations

Teachers in this study all had or were pursuing degrees in early childhood education; thus, these teachers are likely not comparable to many classroom teachers working in early childhood settings due to many programs not requiring teachers to have a degree. Despite this dissimilarity, I argue that many classrooms with teachers lacking a college degree or missing other indicators of a program's readiness to implement MTSS, may need to focus on other professional development needs prior to targeting progress monitoring using TDBO. As discussed by Lonigan and Phillips (2016), a strong foundational base of universal practices (i.e., Tier 1 practices) should be established prior to providing more individualized instruction and assessment within a tiered support system. Given that the use TBDO in this study was conceptualized as a progress monitoring strategy for children needing more individualized support than can be provided through universal instructional practices, teachers with needs related to implementing universal practices should receive professional development on the practices considered prerequisites to more advanced progress monitoring strategies (e.g., authentic assessment, responsive interaction strategies).

Second, there may be concerns regarding the technical adequacy of the progress monitoring assessments conducted in this study. The use of progress monitoring measures that lack demonstrated validity and reliability has been a concern in the field of early childhood education for decades and has contributed to the development of standardized

instruments for progress monitoring (e.g., IGDIs). However, the use of standardized progress monitoring measures within programs that adopt authentic assessment practices presents a philosophical conundrum. That is, to what extent can standardized measures account for children's interests and individual needs, while allowing for the occurrence of behaviors under conditions in which the behaviors will likely be used by the children on a regular basis? As the field continues grappling with this challenge, I assert that the TDBO procedures used in this study promote reliable and valid child responding throughout progress monitoring assessments conducted in programs that adopt authentic assessment practices. By ensuring that teachers are consistently implementing the TBDO procedures with fidelity, there is increased confidence that children's responding is not influenced by the teacher's behavior. Additional research is needed on the extent to which varying the activities and materials across progress monitoring sessions affects the reliability and validity of children's responding.

Lastly, maintenance data were collected with the trainer present in the classroom, which may have resulted in teacher behavior that is not generalizable to teacher behavior when the trainer is not absent. Furthermore, I was unable to identify if teachers continued using in the TDBO procedures after the end of the study. Although it is desirable that teachers will find the procedures useful and incorporate them into their classroom data collection systems, it is more likely that a systems-level approach will be needed to ensure that such progress monitoring data are routinely collected.

4.2 Future Research

Based on the findings within this study and the current state of the early childhood MTSS literature, there are numerous areas of research that should be considered. First,

systematic replication studies are needed to extend the external validity of this study's findings. These studies should occur across early childhood education settings that are funded through differing auspices (e.g., publicly funded, Head Start). Second, studies are needed on the psychometric properties of the TDBO measure and related child outcomes. For example, what is the concurrent validity of child outcomes when measured using TDBO procedures incorporating authentic assessment practices and standardized curriculum-based measures (e.g., IGDIs)? Third, this study did not train teachers to use curriculum-based assessment information to identify meaningful child goals; rather, the trainer guided the teachers through this process. Research is needed on the extent to which early childhood education teachers select meaningful child skills to target for instruction and how teachers select these skills. Fourth, as noted by Ledford and colleagues (2016), advances are needed in how social and ecological validity data are gathered in special education research. More research is needed in mixed method approaches and other data collection systems that account for bias. Lastly, research is needed on the extent to which teachers can analyze progress monitoring ot make appropriate data based decisions. For example, is a modification needed? Should instruction continue as planned? Is the child ready for new targets or a new skill as the focus of their progress monitoring? Answers to these questions would serve as stepping stones to developing an early childhood MTSS model that accounts for all components foundational to MTSS.

4.3 Conclusion

Taken collectively, the results of this study allow for a reliable demonstration of the effectiveness of the evaluated teacher training practices and their impact on teachers' implementation of TDBO procedures. As with all novel studies using single-case designs,

more research is needed to provide reliable empirical support that preschool teachers in inclusive classrooms can efficaciously monitor the progress of their children across a variety of academic related behaviors. Given the amount of resources actively being devoted to evaluating and implementing MTSS within early childhood settings and the importance of progress monitoring to inform instructional decision making within MTSS, this is a timely study and I hope the findings can be replicated and extended.

APPENDICES

APPENDIX 1. INSTITUTIONAL REVIEW BOARD TEACHER CONSENT DOCUMENT

IRB Approval
1/16/2019
IRB # 48353
ID # 97584

Teacher Consent to Participate in a Research Study

KEY INFORMATION FOR:

TRAINING TEACHERS IN INCLUSIVE PRESCHOOL CLASSROOMS TO MONITOR CHILD PROGRESS AND MAKE DATA-BASED DECISION THROUGH DIRECT BEHAVIORAL OBSERVATION:

In this study, researchers will train preschool teachers at the University of Kentucky's Early Childhood Laboratory to collect progress monitoring data within the context of their scheduled classroom activities. The study is anticipated to start in early 2019 and conclude in May of 2019. Training will occur through a combination of multimedia video-based presentation and in-vivo coaching. Video-based presentations will be provided as a digital file to be viewed by participating teachers at a time that is convenient for them. Coaching activities will occur for 2-3 minutes per session across 1-2 sessions per day for approximately 2 weeks until a teacher acquires target progress monitoring behaviors. During weeks in which a teacher is not receiving training, weekly probe sessions will occur to assess changes in a teacher's progress monitoring abilities. Participating teachers will receive $250.00 for their participation.

We are asking you to choose whether or not to volunteer for a research study about training preschool teachers to collect progress monitoring data on their students within the context of regularly scheduled classroom activities. This page is to give you key information to help you decide whether to participate. We have included detailed information after this page. Ask the research team questions. If you have questions later, the contact information for the research investigator in charge of the study is below.

WHAT IS THE STUDY ABOUT AND HOW LONG WILL IT LAST?

By doing this study, we hope to learn about professional development components (i.e., video-based multimedia presentation and coaching) that are effective for training preschool teachers to collect valid and reliable progress monitoring data on their students. In addition, we hope to learn about the feasibly of our professional development components and social validity of the target progress monitoring behaviors. Your participation in this research will last about 5 months.

WHAT ARE KEY REASONS YOU MIGHT CHOOSE TO VOLUNTEER FOR THIS STUDY?

By participating, teachers may acquire new skills to inform their instruction. In addition, participation may provide new or replicated research findings to support the field of early childhood education. For a complete description of benefits and/or rewards, refer to the Detailed Consent.

WHAT ARE KEY REASONS YOU MIGHT CHOOSE NOT TO VOLUNTEER FOR THIS STUDY?

You may choose not to participate in this study given that it will involve conducting progress monitoring assessments on students in addition to those assessments already required by your early childhood educational center. For a complete description of risks, refer to the Detailed Consent.

DO YOU HAVE TO TAKE PART IN THE STUDY?

If you decide to take part in the study, it should be because you really want to volunteer. You will not lose any services, benefits, or rights you would normally have if you choose not to volunteer.

WHAT IF YOU HAVE QUESTIONS, SUGGESTIONS OR CONCERNS?

The person in charge of this study is Collin Shepley of the University of Kentucky, Department of Early Childhood, Special Education, and Rehabilitation Counseling. If you have questions, suggestions, or concerns regarding this study or you want to withdraw from the study his/her contact information is: Collin Shepley, 229 Taylor Education Building, University of Kentucky, 706-248-0069, collinshepley@uky.edu.

If you have any questions, suggestions or concerns about your rights as a volunteer in this research, contact staff in the University of Kentucky (UK) Office of Research Integrity (ORI) between the business hours of 8am and 5pm EST, Monday-Friday at 859-257-9428 or toll free at 1-866-400-9428.

Page **1** of **5**

APPENDIX 2. INSTITUTIONAL REVIEW BOARD PARENTAL CONSENT FOR CHILD PARTICIPATION DOCUMENT

IRB Approval
1/16/2019
IRB # 48353
ID # 97586

Parental Consent for Child Participation in a Research Study

KEY INFORMATION FOR:

TRAINING TEACHERS IN INCLUSIVE PRESCHOOL CLASSROOMS TO MONITOR CHILD PROGRESS AND MAKE DATA-BASED DECISION THROUGH DIRECT BEHAVIORAL OBSERVATION:

In this study, researchers will train preschool teachers at the University of Kentucky's Early Childhood Laboratory to collect data on student progress within the context of their scheduled classroom activities. The study is anticipated to start in early 2019 and conclude in May of 2019. Throughout the course of the study, participating teachers will collect data on three students in their classroom.

We are asking you to choose whether or not to volunteer for a research study about training preschool teachers to collect data on their students within the context of regularly scheduled classroom activities. This page is to give you key information to help you decide whether to allow your child to participate. We have included detailed information after this page. Ask the research team questions. If you have questions later, the contact information for the research investigator in charge of the study is below.

WHAT IS THE STUDY ABOUT AND HOW LONG WILL IT LAST?

By doing this study, we hope to learn about professional development components (e.g., video-presented lectures) that are effective for training preschool teachers to collect meaningful data on their students. In addition, we hope to learn how teachers perceive our professional development components. Your child's participation in this research will last about 5 months.

WHAT ARE KEY REASONS YOU MIGHT CHOOSE TO VOLUNTEER FOR THIS STUDY?

By participating, teachers may acquire new skills to inform their instruction. In addition, participation may provide new or replicated research findings to support the field of early childhood education. For a complete description of benefits and/or rewards, refer to the Detailed Consent.

WHAT ARE KEY REASONS YOU MIGHT CHOOSE NOT TO VOLUNTEER FOR THIS STUDY?

You may choose for your child not to participate because it will involve him or her taking part in assessments that are in addition to those already provided at his or her early childhood educational center. For a complete description of risks, refer to the Detailed Consent.

DO YOU HAVE TO TAKE PART IN THE STUDY?

If you decide to take part in the study, it should be because you really want to volunteer. You will not lose any services, benefits, or rights you would normally have if you choose not to volunteer.

WHAT IF YOU HAVE QUESTIONS, SUGGESTIONS OR CONCERNS?

The person in charge of this study is Collin Shepley of the University of Kentucky, Department of Early Childhood, Special Education, and Rehabilitation Counseling. If you have questions, suggestions, or concerns regarding this study or you want to withdraw from the study his/her contact information is: Collin Shepley, 229 Taylor Education Building, University of Kentucky, 706-248-0069, collinshepley@uky.edu.

If you have any questions, suggestions or concerns about your rights as a volunteer in this research, contact staff in the University of Kentucky (UK) Office of Research Integrity (ORI) between the business hours of 8am and 5pm EST, Monday-Friday at 859-257-9428 or toll free at 1-866-400-9428.

Page **1** of **5**

APPENDIX 3. SAMPLE OF SURVEY OF TEACHER-DIRECTED BEHAVIORAL OBSERVATION PROCEDURES SENT TO PROFESSIONALS

Rating teacher behaviors that are essential to assessing child performance on a skill when using direct behavioral observation with event recording and teacher presented trials:

Behaviors	Operational Definition of Behavior	Rating 0=not necessary 1=useful but not essential 2=essential
Environmental considerations		
Toys and other distracting items are removed or put to the side	Toys or other items are removed from child's hands and lap during session	*Click to rate behavior*
Overview of session and expectations provided to child	Assessor indicates to child what they will be working on, why it's important to learn this skill, it's alright if the child doesn't know, and that they should try their best	*Click to rate behavior*
Assessment materials ready	Stimulus materials, such as flashcards or pictures, are within the assessor's reach once the child is seated	*Click to rate behavior*
Data collection materials ready	Data collection materials, such as data sheet and writing utensil, are within the assessor's reach once the child is seated	*Click to rate behavior*
Programming considerations		
At least one known trial interspersed	Child provides a correct response on at least one trial during a session	*Click to rate behavior*
Child praised for attending or working at least once	Assessor provides behavior specific praise relating to child's attending or working at least once during the presentation of trials	*Click to rate behavior*
If discrete skill, at least 10 target pieces of information included in assessment	10 different target pieces of information are assessed; for example, assessor targets letter labels a, b, c, d, e, f, g, h, i, j	*Click to rate behavior*
If chained skill, at least 5 target pieces of information included in assessment	5 different target pieces of information are assessed; for example, counting 5, 6, 7, 8, 9, and 10 sets of objects	*Click to rate behavior*
If discrete skill, at least 2 trials per target	All target pieces of information receive at least 1 trial during session	*Click to rate behavior*
If chained skill, at least 1 trial per target	All target pieces of information receive at least 1 trial during session	*Click to rate behavior*
Session duration is less than 4 min	Total duration of session from when child is seated to when child is told that the session is finished is less than 4 min	*Click to rate behavior*
Trial procedures		

1

APPENDIX 4. DESCRIPTION OF INCLUDED TEACHER-DIRECTED BEHAVIORAL OBSERVATION PROCEDURES

#	Teacher-directed Behavioral Observation Procedures
1	Instructional materials are within teacher's reach once session begins
2	Data collection materials are within teacher's reach once session begins
3	Teacher provides behavior specific praise related to child's working or attending at least once during the presentation of trials
4	All targets receive at least 1 trial
5	As needed, teacher ensures child's head and eye-gaze are oriented towards teacher or materials during the presentation of verbal task direction for approximately 80% of trials
6	Teacher provides behavior specific praise following child's correct responses for approximately 80% of correct responses
7	Teacher ignores or provides neutral comment (e.g., "OK", "let's keep going") when child provides incorrect response, no response, or says indicates does not know for approximately 80% of incorrect responses
8	Teacher does not provide any form of prompting throughout the assessment; it is acceptable for the teacher to repeat a task direction
9	Following presentation of task direction, teacher waits 3-5 s for discrete skill or 10-20 s for chained skill for child to complete response before moving on to next trial for approximately 80% of trials; if not attempt after 5 s on chained skill then teacher may move on
10	Teacher scores each trial of session so that an observer could look at data sheet to see how child responded on each trial number
11	Teacher scores child response for each target piece of information so that observer could look at data sheet and see how many times a child responded correctly or incorrectly for teach target piece of information
12	Scoring of data allow for the number of correct responses, number of incorrect responses, and total number of trials to be calculated
13	Date of session is indicated on data sheet
14	Name of person conducting assessment is indicted on data sheet
15	Teacher and trainer's data on child responding indicate at least 80% inter-observer agreement

APPENDIX 5. QR CODE AND LINK TO VIEW PROGRESS MONIOTRING VIDEO

https://www.youtube.com/watch?v=j0HHLo3B4X4

APPENDIX 6. DATA SHEET USED BY TRAINER THROUGHOUT ALL STUDY SESSIONS

Date: _____ Teacher: _____ Session: _____ Child: _____

+ correct/implemented - incorrect/not implemented

Time-start: _____

#	Teacher Behaviors	Scoring
1	**Instructional materials are within teacher's reach once session begins**	
2	Data collection materials are within teacher's reach once session begins	
3	Teacher provides behavior specific praise related to child's working or attending at least once during the presentation of trials	
4	All targets receive at least 1 trial	
5	As needed, teacher ensures child's head and eye-gaze are oriented towards teacher or materials during the presentation of verbal task direction for approximately 80% of trials	
6	Teacher provides behavior specific praise following child's correct responses for approximately 80% of correct responses	
7	Teacher ignores or provides neutral comment (e.g., "OK", "let's keep going") when child provides incorrect response, no response, or says indicates does not know for approximately 80% of incorrect responses	
8	**Teacher does not provide any form of prompting throughout the assessment; it is acceptable for the teacher to repeat a task direction**	
9	Following presentation of task direction, teacher waits 3-5 s for discrete skill or 10-20 s for chained skill for child to complete response before moving on to next trial for approximately 80% of trials; if not attempt after 5 s on chained skill then teacher may move on	
10	Teacher scores each trial of session so that an observer could look at data sheet to see how child responded on each trial number	
11	**Teacher scores child response for each target piece of information so that observer could look at data sheet and see how many times a child responded correctly or incorrectly for teach target piece of information**	
12	**Scoring of data allow for the number of correct responses, number of incorrect responses, and total number of trials to be calculated**	
13	**Date of session is indicated on data sheet**	
14	Name of person conducting assessment is indicted on data sheet	
15	**Teacher and trainer's data on child responding indicate at least 80% inter-observer agreement**	

Trials	Child Response	Trials	Child Response
1		11	
2		12	
3		13	
4		14	
5		15	
6		16	
7		17	
8		18	
9		19	
10		20	

Time-end: _____ Data collector: Primary / Reliability

Training Activity	Description	Duration (min)
Waiting	Refers to general waiting by the trainer between planned activities and study sessions within a teacher's classroom	
Direct observation	Observation of a teacher by the trainer when a teacher is engaged in a study session	
Feedback	Provision of feedback to the classroom teacher following direct observation of a study session	

APPENDIX 7. SOCIAL AND ECOLOGICAL VALIDITY QUESTIONNAIRE

Study Questionnaire

Name: _____ Date: _____

Question	Rating 1	2	3
1. How did the training video and feedback interfere with your roles and responsibilities as a teacher?	*Way too much*	*Somewhere in-between*	*Not at all*
2. How much did monitoring child progress interfere with your roles and responsibilities as teachers?	*Way too much*	*Somewhere in-between*	*Not at all*
3. How likely are you to continue using the progress monitoring strategies in your classroom?	*Not a chance*	*Somewhere in-between*	*Highly likely*
4. How difficult are the progress monitoring strategies to use?	*Way too difficult*	*Somewhere in-between*	*Very easy*
5. How difficult is planning to collect progress monitoring data?	*Way too difficult*	*Somewhere in-between*	*Very easy*
6. How much more effective of a teacher do you think you are because of your participating in the training?	*No change*	*Somewhere in-between*	*Highly effective*
7. How important is it for teachers working in inclusive early childhood classrooms to learn to use these strategies?	*Not important*	*Somewhere in-between*	*Very important*

Question	**Free Response** (write in your answer)
8. What, if anything, would you recommend changing about the training procedures (e.g., video, in-person feedback)?	
9. What, if anything, would you recommend changing about the content of training?	
10. Please provide any additional suggestions or comments in this section.	

APPENDIX 8. TEACHER TRAINING HANDOUT

Conducting Meaningful Progress Monitoring Assessments

Tips	Examples
Environment	
Ensure instructional materials are within reach prior to starting	Flashcards, counting blocks, markers, and paper are in an organized assessment box for use during each assessment
Ensure data collection materials are within reach prior to starting	Data sheet and writing utensil are in the location where the assessment will occur
Procedures	
Ensure child is looking at you or materials before asking a question	If a child is looking at a peer in the classroom, tell the child, "Look here" and wait for the child to look before asking a question
For discrete skills, allow 3-5 seconds for a child to respond after asking a question	If you write the letter "K" on a sheet of paper and ask the child, "What is that letter?", wait 3-5 seconds for the child to respond before ending the trial
For chained skills, allow 10-20 seconds for a child to respond after asking a question; if they child makes no attempt to respond after 5 seconds, then it is acceptable to move on to the next trial	If you present 12 objects and ask the child to count the objects, allow the child 10-20 seconds to respond; if the child does not begin counting after 5 seconds then end the trial
Do not provide any help or prompting for a child to answer a question; although, it is acceptable to repeat a question	If a child tells you that he or she does not know the answer, do not provide help. You may tell the child "OK" and then move on to the next question
Provide behavior specific praise for correct responses	If a child correctly labels the letter "K", tell the child, "Yup! That is the letter K."
If a child makes an incorrect response, does not respond, or indicates that he or she doesn't know the answer, then ignore the response or make a neutral comment and move on	If a child says "C" when attempting to label the letter "K", ignore the child's response and move on to the next trial
Make sure that each target piece of information is assessed at least once during each session	If a child is working on labeling the letters in her name, be sure that you ask the child to label each letter in their name at least once
Praise child for working hard and paying attention	"Thanks for looking!", "Wow. You are working really hard."
Data Collection	
Collect data on whether a child's response was correct or incorrect for each question	After each child response, indicate whether the response was correct or incorrect. This can be done using a "+" or a "-".
Indicate what the target piece of information was for each question and the order in which questions were presented	Number each target piece of information prior to starting an assessment or as you go through the assessment to indicate the order of questions
Write the date during which the assessment occurred on the data sheet	10/15/2019
Write your name on the data sheet to indicate you were the person assessing the child	First name or initials are acceptable

QR-code linking to supporting video on progress monitoring

APPENDIX 9. INTEROBSERVER AGREEMENT DATA SHEET

Date: _____ Teacher: _____ Session: _____ Child: _____

\+ correct/implemented - incorrect/not implemented

Time-start: _____

#	Teacher Behaviors	Scoring
1	**Instructional materials are within teacher's reach once session begins**	
2	Data collection materials are within teacher's reach once session begins	
3	Teacher provides behavior specific praise related to child's working or attending at least once during the presentation of trials	
4	All targets receive at least 1 trial	
5	As needed, teacher ensures child's head and eye-gaze are oriented towards teacher or materials during the presentation of verbal task direction for approximately 80% of trials	
6	Teacher provides behavior specific praise following child's correct responses for approximately 80% of correct responses	
7	Teacher ignores or provides neutral comment (e.g., "OK", "let's keep going") when child provides incorrect response, no response, or indicates does not know, for approximately 80% of incorrect responses	
8	**Teacher does not provide any form of prompting throughout the assessment; it is acceptable for the teacher to repeat a task direction**	
9	Following presentation of task direction, teacher waits 3-5 s for discrete skill or 10-20 s for chained skill for child to complete response before moving on to next trial for approximately 80% of trials; if not attempt after 5 s on chained skill then teacher may move on	
10	Teacher scores each trial of session so that an observer could look at data sheet to see how child responded on each trial number	
11	**Teacher scores child response for each target piece of information so that observer could look at data sheet and see how many times a child responded correctly or incorrectly for teach target piece of information**	
12	**Scoring of data allow for the number of correct responses, number of incorrect responses, and total number of trials to be calculated**	
13	**Date of session is indicated on data sheet**	
14	Name of person conducting assessment is indicted on data sheet	
15	**Teacher and trainer's data on child responding indicate at least 80% inter-observer agreement**	

Trials	Child Response	Trials	Child Response
1		11	
2		12	
3		13	
4		14	
5		15	
6		16	
7		17	
8		18	
9		19	
10		20	

Time-end: _____ Data collector: Primary / Reliability

APPENDIX 10. INTEROBSERVER AGREEMENT DATA SHEET

Date: _____ Teacher: _____ Session: _____ Child: _____

Time-start: _____

	Waiting	**Duration: _____**
1	Informs teacher of the child and related behavior for which data will be collected	
2	Behavior specific praise provided to teacher	
3	Corrective comments given	
4	Provide opportunity to watch model of correct implementation	
5	Provide opportunity to have teacher practice with trainer	
6	Provide opportunity to ask questions	
7	No prompting or feedback provided after observing session	
8	Provides a digital file of a video on flash drive	
9	Instructs teacher to watch video in a distraction-free environment within the next 3 school days	
10	Provides a handout to the teacher	
	Direct Observation	**Duration: _____**
1	Informs teacher of the child and related behavior for which data will be collected	
2	Behavior specific praise provided to teacher	
3	Corrective comments given	
4	Provide opportunity to watch model of correct implementation	
5	Provide opportunity to have teacher practice with trainer	
6	Provide opportunity to ask questions	
7	No prompting or feedback provided after observing session	
8	Provides a digital file of a video on flash drive	
9	Instructs teacher to watch video in a distraction-free environment within the next 3 school days	
10	Provides a handout to the teacher	
	Feedback	**Duration: _____**
1	Informs teacher of the child and related behavior for which data will be collected	
2	Behavior specific praise provided to teacher	
3	Corrective comments given	
4	Provide opportunity to watch model of correct implementation	
5	Provide opportunity to have teacher practice with trainer	
6	Provide opportunity to ask questions	
7	No prompting or feedback provided after observing session	
8	Provides a digital file of a video on flash drive	
9	Instructs teacher to watch video in a distraction-free environment within the next 3 school days	
10	Provides a handout to the teacher	

Time end: _____

NOTES:

APPENDIX 11. PROCEDURAL FIDELITY KEY FOR PROBE AND MAINTENANCE SESSIONS

KEY – Probe/Maintenance

+ implemented, **- not implemented**, duration reported in *minutes*

Date: _____ Teacher: _____ Session: _____ Child: _____

Time-start: _____

	Waiting	**Duration: _____**
1	Informs teacher of the child and related behavior for which data will be collected	+
2	Behavior specific praise provided to teacher	-
3	Corrective comments given	-
4	Provide opportunity to watch model of correct implementation	-
5	Provide opportunity to have teacher practice with trainer	-
6	Provide opportunity to ask questions	-
7	No prompting or feedback provided	-
8	Provides a digital file of a video on flash drive	-
9	Instructs teacher to watch video in a distraction-free environment within the next 3 school days	-
10	Provides a handout to the teacher	-
	Direct Observation	**Duration: _____**
1	Informs teacher of the child and related behavior for which data will be collected	-
2	Behavior specific praise provided to teacher	-
3	Corrective comments given	-
4	Provide opportunity to watch model of correct implementation	-
5	Provide opportunity to have teacher practice with trainer	-
6	Provide opportunity to ask questions	-
7	No prompting or feedback provided	-
8	Provides a digital file of a video on flash drive	-
9	Instructs teacher to watch video in a distraction-free environment within the next 3 school days	-
10	Provides a handout to the teacher	-
	Feedback	**Duration: _____**
1	Informs teacher of the child and related behavior for which data will be collected	-
2	Behavior specific praise provided to teacher	-
3	Corrective comments given	-
4	Provide opportunity to watch model of correct implementation	-
5	Provide opportunity to have teacher practice with trainer	-
6	Provide opportunity to ask questions	-
7	No prompting or feedback provided	-
8	Provides a digital file of a video on flash drive	-
9	Instructs teacher to watch video in a distraction-free environment within the next 3 school days	-
10	Provides a handout to the teacher	-

Time end: _____

APPENDIX 12. PROCEDURAL FIDELITY KEY FOR PROBE SESSIONS IMMEDIATELY PRIOR TO INTRODUCIGN TEACHER TRAINING

KEY – Probe session prior to teacher training

+ implemented, **- not implemented**, duration reported in *minutes*

Date: _____ Teacher: _____ Session: _____ Child: _____

Time-start: _____

	Waiting	**Duration: _____**
1	Informs teacher of the child and related behavior for which data will be collected	+
2	Behavior specific praise provided to teacher	-
3	Corrective comments given	-
4	Provide opportunity to watch model of correct implementation	-
5	Provide opportunity to have teacher practice with trainer	-
6	Provide opportunity to ask questions	-
7	No prompting or feedback provided	-
8	Provides a digital file of a video on flash drive	-
9	Instructs teacher to watch video in a distraction-free environment within the next 3 school days	-
10	Provides a handout to the teacher	-
	Direct Observation	**Duration: _____**
1	Informs teacher of the child and related behavior for which data will be collected	-
2	Behavior specific praise provided to teacher	-
3	Corrective comments given	-
4	Provide opportunity to watch model of correct implementation	-
5	Provide opportunity to have teacher practice with trainer	-
6	Provide opportunity to ask questions	-
7	No prompting or feedback provided	-
8	Provides a digital file of a video on flash drive	-
9	Instructs teacher to watch video in a distraction-free environment within the next 3 school days	-
10	Provides a handout to the teacher	-
	Feedback	**Duration: _____**
1	Informs teacher of the child and related behavior for which data will be collected	-
2	Behavior specific praise provided to teacher	-
3	Corrective comments given	-
4	Provide opportunity to watch model of correct implementation	-
5	Provide opportunity to have teacher practice with trainer	-
6	Provide opportunity to ask questions	-
7	No prompting or feedback provided	-
8	Provides a digital file of a video on flash drive	+
9	Instructs teacher to watch video in a distraction-free environment within the next 3 school days	+
10	Provides a handout to the teacher	+

Time end: _____

APPENDIX 13. PROCEDURAL FIDELITY KEY FOR TEACHER TRAINING SESSIONS WITH ACQUISITION CHILDREN

KEY – Teacher Training for acquisition child

+ implemented, **- not implemented**, duration reported in *minutes*

Date: _____ Teacher: _____ Session: _____ Child: _____

Time-start: _____

	Waiting	**Duration: _____**
1	Informs teacher of the child and related behavior for which data will be collected	+
2	Behavior specific praise provided to teacher	-
3	Corrective comments given	-
4	Provide opportunity to watch model of correct implementation	-
5	Provide opportunity to have teacher practice with trainer	-
6	Provide opportunity to ask questions	-
7	No prompting or feedback provided	-
8	Provides a digital file of a video on flash drive	-
9	Instructs teacher to watch video in a distraction-free environment within the next 3 school days	-
10	Provides a handout to the teacher	-
	Direct Observation	**Duration: _____**
1	Informs teacher of the child and related behavior for which data will be collected	-
2	Behavior specific praise provided to teacher	-
3	Corrective comments given	-
4	Provide opportunity to watch model of correct implementation	-
5	Provide opportunity to have teacher practice with trainer	-
6	Provide opportunity to ask questions	-
7	No prompting or feedback provided	-
8	Provides a digital file of a video on flash drive	-
9	Instructs teacher to watch video in a distraction-free environment within the next 3 school days	-
10	Provides a handout to the teacher	-
	Feedback	**Duration: _____**
1	Informs teacher of the child and related behavior for which data will be collected	-
2	Behavior specific praise provided to teacher	+
3	Corrective comments given	+
4	Provide opportunity to watch model of correct implementation	+
5	Provide opportunity to have teacher practice with trainer	+
6	Provide opportunity to ask questions	+
7	No prompting or feedback provided	-
8	Provides a digital file of a video on flash drive	-
9	Instructs teacher to watch video in a distraction-free environment within the next 3 school days	-
10	Provides a handout to the teacher	-

Time end: _____

APPENDIX 14. PROCEDURAL FIDELITY KEY FOR TEACHER TRAINING SESSIONS WITH GENERALIZATION CHILDREN

KEY – Teacher Training for generalization child

+ implemented, **- not implemented**, duration reported in *minutes*

Date: _____ Teacher: _____ Session: _____ Child: _____

Time-start: _____

	Waiting	**Duration: _____**
1	Informs teacher of the child and related behavior for which data will be collected	+
2	Behavior specific praise provided to teacher	-
3	Corrective comments given	-
4	Provide opportunity to watch model of correct implementation	-
5	Provide opportunity to have teacher practice with trainer	-
6	Provide opportunity to ask questions	-
7	No prompting or feedback provided	-
8	Provides a digital file of a video on flash drive	-
9	Instructs teacher to watch video in a distraction-free environment within the next 3 school days	-
10	Provides a handout to the teacher	-
	Direct Observation	**Duration: _____**
1	Informs teacher of the child and related behavior for which data will be collected	-
2	Behavior specific praise provided to teacher	-
3	Corrective comments given	-
4	Provide opportunity to watch model of correct implementation	-
5	Provide opportunity to have teacher practice with trainer	-
6	Provide opportunity to ask questions	-
7	No prompting or feedback provided	-
8	Provides a digital file of a video on flash drive	-
9	Instructs teacher to watch video in a distraction-free environment within the next 3 school days	-
10	Provides a handout to the teacher	-
	Feedback	**Duration: _____**
1	Informs teacher of the child and related behavior for which data will be collected	-
2	Behavior specific praise provided to teacher	-
3	Corrective comments given	-
4	Provide opportunity to watch model of correct implementation	-
5	Provide opportunity to have teacher practice with trainer	-
6	Provide opportunity to ask questions	-
7	No prompting or feedback provided	-
8	Provides a digital file of a video on flash drive	-
9	Instructs teacher to watch video in a distraction-free environment within the next 3 school days	-
10	Provides a handout to the teacher	-

Time end: _____

REFERENCES

Akers, L., Del Grosso, P., Snell, E. K., Atkins-Burnett, S., Wasik, B., Carta, J., ... & Monahan, S. (2016). Tailored teaching: Emerging themes from the literature on teachers' use of ongoing child assessment to individualize instruction. *NHSA Dialog, 19*, 133-150.

Alberto, P. A., & Troutman, A. C. (2006). Applied behavior analysis for teachers. Saddle River, NJ: Pearson/Merrill/Prentice-Hall.

Artman-Meeker, K., Fettig, A., Barton, E. E., Penney, A., & Zeng, S. (2015). Applying an evidence-based framework to the early childhood coaching literature. *Topics in Early Childhood Special Education, 35*, 183-196.

Barton, E. E. (2015). Teaching generalized pretend play and related behaviors to young children with disabilities. *Exceptional Children, 81*, 489-506.

Barton, E. E., & Fettig, A. (2013). Parent-implemented interventions for young children with disabilities: A review of fidelity features. *Journal of Early Intervention, 35*, 194-219.

Barton, E. E., Kinder, K., Casey, A. M., & Artman, K. M. (2011). Finding your feedback fit: Strategies for designing and delivering performance feedback systems. *Young Exceptional Children, 14(1)*, 29-46.

Barton, E. E., Pokorski, E. A., Gossett, S., Sweeney, E., Qiu, J., & Choi, G. (2018). The use of email to coach early childhood teachers. *Journal of Early Intervention*. Advance online publication. doi:1053815118760314

Burns, M. K., Appleton, J. J., & Stehouwer, J. D. (2005). Meta-analytic review of responsiveness-to-intervention research: Examining field-based and research-implemented models. *Journal of Psychoeducational Assessment, 23*, 381-394.

Buysse, V., & Peisner-Feinberg, E. (Eds.). (2013). Handbook of response to intervention in early childhood. Baltimore: Paul H. Brookes Publishing Company.

Buysse, V., Peisner-Feinberg, E., Soukakou, E., Fettig, A., Schaaf, J., & Burchinal, M. (2016). Using recognition & response (R&R) to improve children's language and literacy skills: Findings from two studies. *Early Childhood Research Quarterly, 36*, 11-20.

Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). Applied behavior analysis, 2nd ed. Upper Saddle River, NJ: Pearson.

Division for Early Childhood of the Council for Exceptional Children, National Association for the Education of Young Children, & National Head Start Association. (2013). Frameworks for response to intervention in early childhood: Description and implications. *Communication Disorders Quarterly, 35*, 108-119.

Fallon, L. M., Collier-Meek, M. A., Maggin, D. M., Sanetti, L. M., & Johnson, A. H. (2015). Is performance feedback for educators an evidence-based practice? A systematic review and evaluation based on single-case research. *Exceptional Children, 81*, 227-246.

Fettig, A., & Barton, E. E. (2014). Parent implementation of function-based intervention to reduce children's challenging behavior: A literature review. *Topics in Early Childhood Special Education, 34*, 49-61.

Greenwood, C. R., Bradfield, T., Kaminski, R., Linas, M., Carta, J. J., & Nylander, D. (2011). The response to intervention (RTI) approach in early childhood. *Focus on Exceptional Children, 43(9)*, 1-22.

Grisham-Brown, J. L., & Hemmeter, M. L. (2017). Blended Practices for Teaching Young Children in Inclusive Settings. Baltimore, MD: Brookes Publishing Co.

Grisham-Brown, J. & Pretti-Frontczak, K. (2011). Assessing Young Children using Blended Practices. Baltimore, MD: Brookes Publishing Co.

Hatcher, A., Grisham-Brown, J., & Sese, K. (2018). Teaching and coaching caregivers in a Guatemalan orphanage to promote language in young children. *Journal of International Special Needs Education*. Advance online publication. doi: 10.9782/17-00021

Hemmeter, M. L., Snyder, P., Fox, L., & Algina, J. (2016). Evaluating the implementation of the Pyramid Model for promoting social-emotional competence in early childhood classrooms. *Topics in Early Childhood Special Education, 36*, 133–146.

Kendall, P. C. (1981). Assessing generalization and the single-subject strategies. *Behavior Modification, 5*, 307-319.

Koutsoftas, A. D., Harmon, M. T., & Gray, S. (2009). The effect of tier 2 intervention for phonemic awareness in a response-to-intervention model in low-income preschool classrooms. *Language, Speech, and Hearing Services in Schools, 40*, 116-130.

Lane, J. D., Gast, D. L., Ledford, J. R., & Shepley, C. (2017). Increasing social behaviors in young children with social-communication delays in a group arrangement in preschool. *Education and Treatment of Children, 40*, 115-144.

Lane, J. D., Ledford, J. R., Shepley, C., Mataras, T. K., Ayres, K. M., & Davis, A. B. (2016). A brief coaching intervention for teaching naturalistic strategies to parents. *Journal of Early Intervention, 38*, 135-150.

Lane, J. D., Shepley, C., & Spriggs, A. (in press). Issues and improvements in the visual analysis of A-B single-case graphs by pre-service professionals. *Remedial and Special Education*.

Lambert, J. M., Lloyd, B. P., Staubitz, J. L., Weaver, E. S., & Jennings, C. M. (2014). Effect of an automated training presentation on pre-service behavior analysts' implementation of trial-based functional analysis. *Journal of Behavioral Education, 23*, 344-367.

Ledford, J. R., Lane, J. D., Zimmerman, K. N., Chazin, K. T., & Ayres, K. A. (2016, April). Single case analysis and review framework (SCARF). Retrieved from: http://vkc.mc.vanderbilt.edu/ebip/scarf/

Ledford, J. R., & Wolery, M. (2015). Observational learning of academic and social behaviors during small-group direct instruction. *Exceptional Children, 81*, 272-291.

Ledford, J. R., Zimmerman, K. N., Harbin, E. R., & Ward, S. E. (2017). Improving the use of evidence-based instructional practices for paraprofessionals. *Focus on Autism and Other Developmental Disabilities*. Advance online publication. doi:1088357617699178

Lonigan, C. J., Schatschneider, C., & Westberg, L. (2008). Impact of code-focused interventions on young children's early literacy skills. Developing Early Literacy: *Report of the National Early Literacy Panel*, 107-151.

McLean, M. E., Bailey, D. B., & Wolery, M. (2004). Assessing infants and preschoolers with special needs. Englewood Cliffs, NJ: Merrill.

Missall, K. N., Carta, J. J., McConnell, S. R., Walker, D., & Greenwood, C. R. (2008). Using individual growth and development indicators to measure early language and literacy. *Infants & Young Children, 21*, 241-253.

Neely, L., Garcia, E., Bankston, B., & Green, A. (2018). Generalization and maintenance of functional communication training for individuals with developmental disabilities: A systematic and quality review. *Research in Developmental Disabilities, 79*, 116-129.

Osnes, P. G., & Lieblein, T. (2003). An explicit technology of generalization. *The Behavior Analyst Today, 3*, 364-374.

Lonigan, C. J., & Phillips, B. M. (2016). Response to instruction in preschool: Results of two randomized studies with children at significant risk of reading difficulties. *Journal of Educational Psychology, 108*, 114-129.

Ruble, L. A., McGrew, J. H., Toland, M. D., Dalrymple, N. J., & Jung, L. A. (2013). A randomized controlled trial of COMPASS web-based and face-to-face teacher coaching in autism. *Journal of Consulting and Clinical Psychology, 81*, 566.

Shepley, C. & Grisham-Brown, J. (2019). Multi-tiered systems of support for preschool-aged children: A review and meta-analysis. *Early Childhood Research Quarterly, 47*, 296-308.

Shepley, C., Lane, J. D., Grisham-Brown, J., Spriggs, A., Winstead, O. (2018.). Effects of a training package to increase teachers' fidelity of naturalistic instructional procedures in inclusive preschool classrooms. *Teacher Education and Special Education, 41*, 321-339.

Shepley, S. B., Spriggs, A., Samudre, M., & Sartini, E. (2018). Initiation and generalization of self-instructed video activity schedules for elementary students with intellectual disability. *Journal of Special Education*. Advance online publication.

Snyder, P. A., Hemmeter, M. L., & Fox, L. (2015). Supporting implementation of evidence-based practices through practice-based coaching. *Topics in Early Childhood Special Education, 35*, 133-143.

Stecker, P. M., Fuchs, L. S., & Fuchs, D. (2005). Using curriculum-based measurement to improve student achievement: Review of research. Psychology in the Schools, 42, 795-819.

Stokes, T. F., & Baer, D. M. (1977). An implicit technology of generalization. *Journal of Applied Behavior Analysis, 10*, 349-367.

Tillman, T. C. (2000). Generalization programming and behavioral consultation. *The Behavior Analyst Today, 1*, 30-34.

VanDerHeyden, A. M., Witt, J. C., & Gilbertson, D. (2007). A multi-year evaluation of the effects of a response to intervention (RTI) model on identification of children for special education. *Journal of School Psychology, 45*, 225-256.

Walker, D., Carta, J. J., Greenwood, C. R., & Buzhardt, J. F. (2008). The use of individual growth and developmental indicators for progress monitoring and intervention decision making in early education. *Exceptionality, 16*, 33-47.

What Works Clearinghouse. (2017). *Standards Handbook Version 4.0*. Retrieved from https://ies.ed.gov/ncee/wwc/Docs/referenceresources/wwc_standards_handbook_v4.pdf.

Zhu, L., Grisham-Brown, J., Shepley, C., & Lane, J. D. (n.d.). Coaching parents of dual language learners to use naturalistic language strategies.

Zimmerman, K. N., Ledford, J. R., Severini, K. E., Pustejovsky, J. E., Barton, E. E., & Lloyd, B. P. (2018). Single-case synthesis tools I: Comparing tools to evaluate SCD quality and rigor. *Research in Developmental Disabilities, 79*, 19-32.

VITA

Collin Shepley received his Bachelors' and Masters' degrees from the University of Georgia in Special Education. Prior to coming to the University of Kentucky he worked as a public school special education teacher serving kindergarten and preschool-aged children. Since being at the University of Kentucky he has received numerous scholarships and was selected as a Doctoral Student Scholar by the Council for Exceptional Children's Division for Research. Collin Shepley has over 20 publications in peer-reviewed journals and special education textbooks.